No. 97-1709

(4)

FILED

AUG 24 1998

THE CLERK
SUPREME COURT, U.S.

IN THE

Supreme Court of the United States

OCTOBER TERM, 1998

KUMHO TIRE COMPANY, LTD., KUMHO U.S.A., INC., AND HERCULES TIRE & RUBBER COMPANY, INC.,
Petitioners,

v.

PATRICK CARMICHAEL, AN INDIVIDUAL AND FATHER AND NEXT OF KIN TO PATRICK CARMICHAEL, JR., A MINOR, LUZVIMINDA CARMICHAEL, AN INDIVIDUAL AND MOTHER AND NEXT FRIEND OF CARINA HORN, A MINOR, AND ADMINISTRATRIX OF THE ESTATE OF JANICE HORN, CARINA HORN, A MINOR, LEONA CARMICHAEL, SHAMEELA CARMICHAEL, AND NATIMAH CARMICHAEL,
Respondents.

On Writ of Certiorari to the United States Court of Appeals for the Eleventh Circuit

---

BRIEF OF RUBBER MANUFACTURERS ASSOCIATION AS *AMICUS CURIAE* IN SUPPORT OF PETITIONERS

MICHAEL L. MCALLISTER
MICHAEL L. MCALLISTER, LTD.
2025 North Third Street
Suite 100
Phoenix, Arizona 85004
(602) 253-8840

BERT BLACK
Counsel of Record
JOHN SEPEHRI
HUGHES & LUCE, L.L.P.
1717 Main Street
Suite 2800
Dallas, Texas 75201
(214) 939-5500

MICHAEL S. TRUESDALE
HUGHES & LUCE, L.L.P.
111 Congress Avenue
Suite 900
Austin, Texas 78701
(512) 482-6800
Counsel for Amicus Curiae

August 24, 1998

WILSON - EPES PRINTING CO., INC. - 789-0096 - WASHINGTON, D.C. 20001

40 pp

QUESTIONS PRESENTED

1. Does the rule in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), that expert testimony must constitute valid, reliable, and relevant knowledge from the expert's field, have an exception for experts who provide no reasoned and principled explanations for their opinions, but instead reach conclusions based solely on their experience?

2. Is it proper for a trial court to apply the kind of gatekeeping analysis set forth in *Daubert* when determining the admissibility of engineering failure analysis expert testimony?

TABLE OF CONTENTS

	Page
QUESTIONS PRESENTED	ii
TABLE OF AUTHORITIES	v
INTEREST OF *AMICUS CURIAE*	2
STATEMENT OF THE CASE	3
SUMMARY OF ARGUMENT	5
ARGUMENT	7
I. *DAUBERT* AND THE FEDERAL RULES OF EVIDENCE ENCOMPASS ALL EXPERT WITNESSES, AND PROVIDE NO EXCEPTION FOR "EXPERIENCE WITHOUT PRINCIPLES" TESTIMONY	7
A. The Fundamental Principle of *Daubert* Applies to All Expert Testimony	7
B. Rule 702 Does Not Contemplate Artificial Categories of Expertise, Nor Does It Require Separate Lists of Factors for Different Kinds of Experts	10
C. Admitting Testimony Based Only on an Expert's Claimed Experience Ignores Rule 702's Knowledge and Relevance Requirements and the Requirements of Rule 703	11
II. BECAUSE ENGINEERS AND SCIENTISTS USE THE SAME BASIC METHODOLOGY AND REASONING PROCESS TO EVALUATE THE VALIDITY AND RELIABILITY OF THEIR WORK, IT IS PROPER TO USE *DAUBERT'S* GUIDANCE ON SCIENTIFIC EVIDENCE IN ASSESSING THE ADMISSIBILITY OF ENGINEERING FAILURE ANALYSIS EXPERT TESTIMONY	14

TABLE OF CONTENTS—Continued

	Page
A. The Reasoning and Methodology of Engineering Do Not Differ from the Reasoning and Methodology of Science	14
B. Failure Analysis Is an Integral Part of Engineering, and It Is Based on Scientific Reasoning and Methodology	16
C. The Considerations Outlined in *Daubert* for Assessing the Admissibility of Scientific Evidence Are Applicable to Engineering Failure Analysis Testimony	19
III. TIRES ARE COMPLEX AND SOPHISTICATED PRODUCTS, AND A VALID AND RELIABLE TIRE FAILURE ANALYSIS REQUIRES FAR MORE THAN AN "EXPERIENCE WITHOUT PRINCIPLES"/LOOK AND GUESS APPROACH	20
A. Modern Tires Are Complex and Sophisticated Products	21
B. The Appropriate Approach to Tire Failure Analysis	23
C. The Expert Testimony in this Case Was Based Upon Speculation, was Logically Invalid and Failed to Follow Appropriate and Accepted Methods—All From an Expert Who Admitted He Did Not Know if the Basis for His Opinions Was Correct or Incorrect	27
CONCLUSION	30

TABLE OF AUTHORITIES

CASES

	Page
Allen v. Pennsylvania Engineering Corp., 102 F.3d 194 (5th Cir. 1996)	13
Berry v. City of Detroit, 25 F.3d 1342 (6th Cir. 1994), *cert. denied*, 513 U.S. 1111 (1995)	12, 16
Bogosian v. Mercedez Benz of North America, Inc., 104 F.2d 472 (1st Cir. 1997)	8
Carmichael v. Samyang Tire, Inc., 131 F.3d 1433 (11th Cir. 1997)	3, 4, 14
Carmichael v. Samyang Tires, Inc., 923 F. Supp. 1514 (S.D. Ala. 1996), *rev'd*, 131 F.3d 1433 (1997)	3, 4, 5, 27
Christophersen v. Allied-Signal Corp., 939 F.2d 1106 (5th Cir. 1991), *cert. denied*, 503 U.S. 912 (1992)	13
Clement v. Griffin, 634 So.2d 412 (La. Ct. App. 1994)	23, 25
Compton v. Subaru of America, Inc., 82 F.3d 1513 (10th Cir.), *cert. denied*, —— U.S. ——, 117 S. Ct. 611 (1996)	11
Cummins v. Lyle Industries, 93 F.3d 362 (7th Cir. 1996)	8, 10, 16
Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993)	*passim*
DeJager Construction Co. v. Schleininger, 938 F. Supp. 446 (W.D. Mich. 1996)	8
Diviero v. Uniroyal Goodrich Tire Co., 919 F. Supp. 1353 (D. Ariz. 1996), *aff'd*, 114 F.3d 851 (9th Cir. 1997)	*passim*
Diviero v. Uniroyal Goodrich Tire Co., 114 F.3d 851 (9th Cir. 1997)	27, 29
Freeman v. Case Corp., 118 F.3d 1011 (4th Cir. 1997), *cert. denied*, —— U.S. ——, 118 S. Ct. 739 (1998)	11
Frymire-Brinati v. KPMG Peat Marwick, 2 F.3d 183 (7th Cir. 1993)	8
Gammill v. Jack Williams Chevrolet, Inc., 1998 WL 352951 (Tex. 1998)	9, 16, 27
General Electric Company v. Joiner, —— U.S. ——, 118 S. Ct. 512 (1997)	3, 19, 30

TABLE OF AUTHORITIES—Continued

	Page
Habecker v. Clark Equipment Co., 36 F.3d 278 (3d Cir. 1994), *cert. denied*, 514 U.S. 1003 (1995)	8
Iacobelli Construction, Inc. v. County of Monroe, 32 F.3d 19 (2d Cir. 1994)	10
Jaurequi v. John Deere Co., 971 F. Supp. 416 (E.D. Mo. 1997)	16
Joy v. Bell Helicopter Textron, Inc., 999 F.2d 549 (D.C. Cir. 1993)	8
Marcel v. Placid Oil Co., 11 F.3d 563 (5th Cir. 1994)	8
McKendall v. Crown Control Corp., 122 F.3d 803 (9th Cir. 1997)	10
Michigan Millers Mutual Insurance Corp. v. Benfield, 140 F.3d 915 (11th Cir. 1998)	11
Mitchell v. Uniroyal Goodrich Tire Co., 666 So.2d 727 (La. Ct. App. 1995)	23, 25
Moore v. Ashland Chemical Co., 1998 WL 476214 (5th Cir. 1998)	12
Peitzmeier v. Hennessey Industries, Inc., 97 F.3d 293 (8th Cir. 1996), *cert. denied*, —— U.S. ——, 117 S. Ct. 1552 (1997)	8
Renaud v. Martin Marietta Corp., Inc., 972 F.2d 304 (10th Cir. 1992)	13
Smelser v. Norfolk Southern Railway Co., 105 F.3d 299 (6th Cir.), *cert. denied*, —— U.S. ——, 118 S. Ct. 67 (1997)	8
Target Market Publishing, Inc. v. Advo, Inc., 136 F.3d 1139 (7th Cir. 1998)	11, 13
Watkins v. Telsmith, Inc., 121 F.3d 984 (5th Cir. 1997)	8, 10, 11, 13, 16

STATUTES

Ala. Code § 32-5-210-(a) (1) (1997)	3

RULES

Federal Rules of Edivence 702	*passim*
703	*passim*

TABLE OF AUTHORITIES—Continued

REGULATIONS

	Page
49 C.F.R. § 570.009	3
49 C.F.R. § 571.109	22-23
49 C.F.R. § 571.119	22

MISCELLANEOUS

THE AMERICAN HERITAGE COLLEGE DICTIONARY (3rd ed. 1997)	14
6 THE WORLD BOOK ENCYCLOPEDIA (1991)	15
American College of Trial Lawyers, *Standards and Procedures for Determining the Admissibility of Expert Evidence After* Daubert, 157 F.R.D. 571 (1994)	9
R. C. G. Arridge, AN INTRODUCTION TO POLYMER MECHANICS (1985)	22
Bert Black, et al., *The Law of Expert Testimony—A Post-*Daubert *Analysis, in* EXPERT EVIDENCE: A PRACTITIONER'S GUIDE TO LAW, SCIENCE, AND THE FJC MANUAL 9 (1997)	7
Bert Black, et al., *Science and the Law in the Wake of* Daubert: *A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715 (1994)	15
Stephen Bobo, *Tire Flaws and Separations, in* MECHANICS OF PNEUMATIC TIRES 636 (Samuel K. Clark ed., 2d ed. 1981)	21, 23, 25, 26
Harold Carlson, SPRINGS: TROUBLESHOOTING AND FAILURE ANALYSIS (1980)	18
Samuel K. Clark, editor, MECHANICS OF PNEUMATIC TIRES (2d ed. 1981)	24
Jack A. Collins, FAILURE OF MATERIALS IN MECHANICAL DESIGN: ANALYSIS, PREDICTION, PREVENTION (1981)	18
Irving M. Copi & Carl Cohen, INTRODUCTION TO LOGIC (8th ed. 1990)	28
Lawrence H. Curtis & James D. Gardner, *Methodology of Science and Law in Product Liability* (Proceedings PLP-77E, New Jersey Institute of Technology, 1977)	25, 26

TABLE OF AUTHORITIES—Continued

Page

Stephen D. Easton, *"Yer Outta Here!" A Framework for Analyzing the Potential Exclusion of Expert Testimony Under the Rules of Evidence*, 32 U. RICH. L. REV. 1 (1998) 9

David L. Faigman, *Mapping the Labyrinth of Scientific Evidence*, 46 HASTINGS L.J. 555 (1995) 9

James K. Feibleman, SCIENTIFIC METHOD (THE HYPOTHETICO-EXPERIMENTAL LABORATORY PROCEDURE OF THE PHYSICAL SCIENCES) (1972) 28

G. Michael Fenner, *The* Daubert *Handbook: The Case, Its Essential Dilemma, and Its Progeny*, 29 CREIGHTON L. REV. 939 (1996) 9

S. D. Gehman, *Rubber Structure and Properties, in* MECHANICS OF PNEUMATIC TIRES 1 (Samuel K. Clark ed., 2d ed. 1981) 21, 22

V.E. Gough, *Structure of the Pneumatic Tire, in* MECHANICS OF PNEUMATIC TIRES 225 (Samuel K. Clark ed., 2d ed. 1981) 22

G. R. Hamen, et al., *Tensile and Tear of Anisotropic Double Networks of a Black Filled Natural Ruber Vulcanizate, in* MECHANISM OF FATIGUE AND ABRASION OF RUBBER VULCANIZATES (Edison Polymer Innovation Corporation, 1997) 25

Jonathan M. Hoffman, Daubert's *Application to Testimony From Non-Scientific Experts*, 30 PROD. SAFETY & LIAB. REP. 738 (1998) 9

Edward J. Imwinkelried, *The Next Step After* Daubert: *Developing a Similarly Epistemological Approach to Ensuring the Reliability of Non-scientific Expert Testimony*, 15 CARDOZO L. REV. 2271 (1994) 9

F. J. Kovac & M. B. Rodgers, *Tire Engineering, in* SCIENCE AND TECHNOLOGY OF RUBBER 675 (James E. Mark et al. eds., 1994) 20, 21, 22

A. B. Mitchell, et al., *The Application of Fractography and Other Examination Methods to the Failure Analysis of Polymeric Components, in* FAILURE ANALYSIS: TECHNIQUES AND APPLICATIONS 269 (J. I. Dickson et al. eds., 1992) 25

TABLE OF AUTHORITIES—Continued

Page

Shin-ichi Nishida, FAILURE ANALYSIS IN ENGINEERING APPLICATIONS (1992) 16, 18

Jan P. Norbye, THE MICHELIN MAGIC (1982) 20

Henry Petroski, DESIGN PARADIGMS: CASE HISTORIES OF ERROR AND JUDGMENT IN ENGINEERING (1994) 16

Henry Petroski, *The Iron Ring*, 83 AMERICAN SCIENTIST 229 (1995) 16, 17

Henry Petroski, TO ENGINEER IS HUMAN: THE ROLE OF FAILURE IN SUCCESSFUL DESIGN (Vintage Books ed. 1992) 15

R. A. Ridha & M. Theves, *Advances in Tire Mechanics, in* RAPRA REVIEW REPORTS 3 (Report 77, 1994) 20, 21, 22

C.L. Schnuth, et al., *Compression Grooving and Rim Flange Abrasion as Indicators of Overdeflected Operating Conditions in Tires* (Based on paper presented to Rubber Division of American Chemical Society, October 21-24, 1997) 24

Rubber Manufactures Association, CARE AND SERVICE OF AUTOMOBILE AND LIGHT TRUCK TIRES (1987) 24

Ronald W. Smith, *The Microscopy of Catastrophic Tire Failures, in* 70 RUBBER CHEMISTRY AND TECHNOLOGY 283 (1997) 25

Task Committee on Guidelines for Failure Investigation, GUIDELINES FOR FAILURE INVESTIGATION (1989) 17, 19

H. van Eldik Thieme & A. J. Dijks, *Measurement of Tire Properties, in* MECHANICS OF PNEUMATIC TIRES 541 (Samuel K. Clark ed., 2d ed. 1981) 22

Tire Maintenance Council, RECOMMENDED MAINTENANCE PRACTICES MANUAL AV2-8 (1992-1993) 24

James R. Varner, *Descriptive Fractography, in* 4 ENGINEERED MATERIALS HANDBOOK 635 (1991) 18

TABLE OF AUTHORITIES—Continued

	Page
Walter G. Vincenti, WHAT ENGINEERS KNOW AND HOW THEY KNOW IT: ANALYTICAL STUDIES FROM AERONAUTICAL HISTORY (1990)	15
J.D. Walter & R.K. Kiminecz, *Bead Contact Pressure Measurements at the Tire Rim Interface* (Presented to the Society of Automative Engineers, February 24-28, 1978)	24
Charles E. Witherell, MECHANICAL FAILURE AVOIDANCE: STRATEGIES AND TECHNIQUES (1994)	17

IN THE
Supreme Court of the United States

OCTOBER TERM, 1998

No. 97-1709

KUMHO TIRE COMPANY, LTD., KUMHO U.S.A., INC., AND HERCULES TIRE & RUBBER COMPANY, INC.,
Petitioners,

v.

PATRICK CARMICHAEL, AN INDIVIDUAL AND FATHER AND NEXT OF KIN TO PATRICK CARMICHAEL, JR., A MINOR, LUZVIMINDA CARMICHAEL, AN INDIVIDUAL AND MOTHER AND NEXT FRIEND OF CARINA HORN, A MINOR, AND ADMINISTRATRIX OF THE ESTATE OF JANICE HORN, CARINA HORN, A MINOR, LEONA CARMICHAEL, SHAMEELA CARMICHAEL, AND NATIMAH CARMICHAEL,
Respondents.

On Writ of Certiorari to the United States Court of Appeals for the Eleventh Circuit

BRIEF OF RUBBER MANUFACTURERS ASSOCIATION AS *AMICUS CURIAE* IN SUPPORT OF PETITIONERS

Amicus curiae respectfully prays that this Court reverse the Eleventh Circuit's ruling in this case and reinstate the District Court's judgment in favor of the Petitioners. All parties have granted blanket consent to the filing of *amicus* briefs, and correspondence evidencing such consent has been filed with the Clerk of this Court.

INTEREST OF *AMICUS CURIAE* *

The Rubber Manufacturers Association ("RMA") is the primary trade association representing the interests of the tire and rubber industry in the United States. RMA's membership includes all of the country's major tire manufacturers.[1] RMA's tire company members employ over 77,000 people and have manufacturing facilities located in seventeen states. Last year, their forty-two domestic manufacturing plants processed more than two billion tons of rubber and produced 350 million tires and tubes. Annual tire sales in North America currently approximate twenty billion dollars. The tire industry is a critical supplier to the nation's multi-billion dollar motor vehicle industry, which includes not only automobiles, but trucks, buses, and industrial and agricultural vehicles.

As explained *infra*, today's tires are far more complex and sophisticated than most people realize. A passenger car tire, for example, is made up of numerous different materials and parts that interact dynamically to provide motive traction. Passenger tires also play a crucial role in braking, steering, handling, and absorbing shocks, and they perform all these functions under a wide range of climatic and road conditions. They are carefully designed products of modern science, engineering and technology, and may be the most complex components of a motor vehicle.

The RMA is vitally interested in this case because its constituent members routinely face unsubstantiated expert testimony that can result in verdicts against defendants for damages and injuries they did not cause. The Ameri-

* Pursuant to Rule 37 of the Rules of this Court, *amicus curiae* Rubber Manufacturers Association hereby certifies that no counsel for any party authored any part of this brief, and no person other than *amicus curiae*, its members, or its counsel made any monetary contribution to the preparation or submission of the brief.

1 Petitoners Kumho U.S.A., Inc. and Hercules Tire & Rubber Company, Inc. are affiliate members of RMA.

can consumer, in turn, also may pay: prices can go up and new and beneficial products may never be developed or brought to market. This Court's holdings in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), and *General Electric Company v. Joiner*, —— U.S. ——, 118 S. Ct. 512 (1997), have greatly restricted the use and ill-effects of such unsubstantiated expert testimony. The impact of *Daubert* and *Joiner*, however, is threatened by the Eleventh Circuit's decision in the instant case.

STATEMENT OF THE CASE

The Plaintiffs in this case (here Respondents) were injured in a single vehicle automobile accident that allegedly occurred when a tire failed on the minivan in which they were riding. They claimed a manufacturing or design defect caused the failure. To prove this claim the Plaintiffs proffered the testimony of Dennis Carlson, a mechanical engineer who opined at his deposition that the tire was defective because a cursory inspection did not reveal conclusive signs of abuse. *Carmichael v. Samyang Tire, Inc.*, 131 F.3d 1433, 1436 (11th Cir. 1997), *Carmichael v. Samyang Tires, Inc.*, 923 F. Supp. 1514, 1518-19 (S.D. Ala. 1996), *rev'd* 131 F.3d 1433 (1997). He reached this conclusion even though he could not identify "any affirmative evidence of a defect in the tire." *Carmichael*, 923 F. Supp. at 1519.

The tire in question was about five years old at the time of the accident, and in some places no tread remained.[2] According to one of the Plaintiffs' witnesses, it "had been punctured by a nail or screw at some point during its service life, and . . . the exterior holes caused by the puncture had not been adequately filled." *Id.* at 1517. Carlson himself indicated the failure "most likely

2 Indeed, given the reduced amount of tread, the tire should have been removed from service under Federal guidelines and Alabama law. 49 C.F.R. § 570.009; Ala. Code § 32-5-210(a)(1) (1997).

began under a bald spot . . . where the tread was completely worn." *Id.* at 1519. He also observed "some evidence of uneven tread wear, sidewall deterioration, abnormal bead grooving, and rim flange impressions," *id.*, all of which he acknowledged were signs of abuse. *Id.*

Nonetheless, Carlson refused to change his initial opinion that a defect caused the failure, even though he had reached this conclusion without having seen the tire at all. He reviewed a colleague's file and "did not personally examine the tire until approximately one hour before [he was deposed.]" *Carmichael,* 131 F.3d at 1434. Moreover, he "conceded that such actions as cutting the tire [which he had not done] could reveal additional pertinent information." *Carmichael,* 923 F. Supp. at 1519. In the end, he provided only a vague *ad hoc* explanation concocted to fit the selected facts on which he chose to rely.

The District Court excluded this testimony after conducting a review based on the scientific validity factors outlined in *Daubert*—testability and testing, peer review and publication, error rate and standards, and general acceptance in the relevant scientific community.[3] *Daubert,* 509 U.S. at 593-94, *cited at Carmichael,* 923 F. Supp. at 1520. The Eleventh Circuit reversed, holding that because Carlson had relied solely on experience-based observations, and had not applied any scientific principles, the trial judge should not have followed *Daubert, Carmichael,* 131 F.3d at 1436. Carlson, however, admitted "that he [did] not know whether his . . . [prior]

[3] The court did not slavishly limit itself to the *Daubert* factors. In rejecting Plaintiffs' motion for reconsideration of its grant of summary judgment the court explained why it had applied these factors and made clear that its "analysis revealed no countervailing factors operating in favor of admissibility which could outweigh those identified in *Daubert*, and the parties identified no such factors in their briefs" Appendix C to Petitioners' Petition for a Writ of Certiorari at 4c.

analyses of failed tires [were] correct or incorrect." *Carmichael,* 923 F. Supp. at 1521. The "experience" upon which the appellate court based its ruling therefore went no further than looking at failed tires and guessing at the cause of failure.

SUMMARY OF ARGUMENT

The Eleventh Circuit's ruling that "experience without principles" expert testimony is not covered by *Daubert* was based on a misinterpretation of both *Daubert* and the Federal Rules of Evidence (the "Rules"). This ruling reflects the inconsistent and occasionally ill-reasoned post-*Daubert* application of Rule 702 by some lower courts. Many courts have recognized the fundamental principle underlying both the rule and *Daubert* gatekeeping, namely that *all* expert testimony must constitute valid, reliable, and relevant knowledge from the expert's field. Other courts, however, have limited gatekeeping to science. Some have held it inapplicable even to engineering, a field in which science and scientific reasoning are essential.

This confusion about *Daubert* has resulted in large part from focusing on artificially distinct categories of evidence and separate lists of factors instead of the central holding of the case. If scientific experts can testify only about valid, reliable, and relevant scientific knowledge, however, it logically follows that any expert must be limited to valid, reliable, and relevant knowledge from his or her area of expertise. The phrase "scientific, technical, or other specialized knowledge" in Rule 702 does not establish distinct and separate categories. It merely emphasizes that the rule encompasses all kinds of expert testimony. Establishing an exception to Rule 702's reliability and relevance requirements that would allow experts to reach conclusions based solely on experience is perhaps the most ill-conceived of the artificial distinctions that have developed since *Daubert* was decided in 1993, and it is contrary to both Rule 702 and Rule 703.

By categorizing Carlson's look and guess testimony as "non-scientific," the Eleventh Circuit implied either that engineering does not fit within the "scientific category," or that failure analysis is not engineering, but these distinctions are simply wrong. Engineers rely heavily on scientific principles and reasoning, and failure analysis involves the same kind of reasoned and rational methodology used by scientists and engineers in other areas. Hence the kind of gatekeeping review outlined in *Daubert* for assessing the validity of scientific expert evidence is also appropriate for determining the admissibility of engineering failure analysis testimony.

Because tires are complex and sophisticated products, a valid and reliable tire failure analysis that would meet the requirements of *Daubert* and the Rules must involve far more than Carlson's look and guess approach. Tires are comprised of many different components that are assembled and then vulcanized, a process involving heat and pressure that causes chemical changes and that bonds the various pieces together. Each component of a tire serves a different function, but each also affects the others.

The analysis of how and why a complex product like a tire fails is not a simple or trivial matter. Though most failures are the result of abuse, engineers have developed a principled and rational approach to determine reliably why any given tire failed. This approach is based on reasoned explanations and precise observations. It is very different from Carlson's *ad hoc* explanations and simple reliance on his claimed experience looking at tires and guessing what caused them to fail.

The Eleventh Circuit's acceptance of conclusions based only on an expert's experience, and its rigid and artificial distinction between scientific and non-scientific evidence led it to ignore the kind of failure analysis reasoning and methodology engineers routinely employ outside the

courtroom. Its ruling should be reversed, and the District Court's judgment for the Defendants should be reinstated.

ARGUMENT

I. *DAUBERT* AND THE FEDERAL RULES OF EVIDENCE ENCOMPASS ALL EXPERT WITNESSES, AND PROVIDE NO EXCEPTION FOR "EXPERIENCE WITHOUT PRINCIPLES" TESTIMONY.

Daubert clarified, but did not change, the analytical framework established by the Federal Rules of Evidence for determining the admissibility of expert evidence. Under its holding the primary admissibility standard resides in Rule 702, but Rule 703 continues to govern the bases for an expert's testimony. *Daubert* and the Rules cover all experts, and there is no exception for those who apply no principles, but rely only on their experience.

A. The Fundamental Principle of *Daubert* Applies to All Expert Testimony.

Daubert's central message is that expert testimony must constitute valid, reliable, and relevant specialized knowledge from the expert's field of expertise.[4] Although this Court's decision in *Daubert* addressed only science, 509 U.S. at 590 n.8, the holding that the admissibility of scientific evidence depends on the scientific validity of an expert's reasoning or methodology, *id.* at 592-93, must, as a matter of simple logic, extend to other kinds of expert testimony as well. An economist's testimony, for example, should be admitted only if it is validly based on

---

[4] The relationship betwen validity, reliability, and relevance is discussed in Bert Black et al., *The Law of Expert Testimony: A Post-*Daubert *Analysis, in* EXPERT EVIDENCE: A PRACTITIONER'S GUIDE TO LAW, SCIENCE AND THE FJC MANUAL 9, 20-22 (1997).

the principles of economics,[5] and an expert accountant should be limited to valid accounting.[6]

Whatever kind of expertise is at issue, a court should evaluate the validity of the methodology and reasoning underlying an expert's testimony to assure that it in fact constitutes genuine knowledge from the expert's field. As the Seventh Circuit has held "[t]he basic task of the District Court remains essentially the same [for all experts]—to insure that the evidentiary submission is of an acceptable level of 'evidentiary reliability.'" *Cummins v. Lyle Indus.*, 93 F.3d 362, 368 n.2 (7th Cir. 1996).[7]

---

[5] *See, e.g., Marcel v. Placid Oil Co.*, 11 F.3d 563, 567-68 (5th Cir. 1994) (affirming trial court's exclusion of defendant's economics expert); *Joy v. Bell Helicopter Textron, Inc.*, 999 F.2d 549, 567-70 (D.C. Cir. 1993) (reversing trial court's decision to admit economic testimony).

[6] *See e.g., Frymire-Brinati v. KPMG Peat Marwick*, 2 F.3d 183, 186-87 (7th Cir. 1993) (holding trial court had improperly admitted accountant's testimony); *DeJager Constr. Co. v. Schleininger*, 938 F. Supp. 446, 455 (W.D. Mich. 1996) ("This Court's decision . . . . is based on [the expert's] *modus operandi* of making unsupported assertions and projections, [and] of deliberately ignoring documents and figures which would strike a certified public accountant in the face").

[7] Like the present case, *Cummins* involved engineering testimony. *See also Peitzmeier v. Hennessy Indus., Inc.*, 97 F.3d 293, 297-98 (8th Cir. 1996), *cert. denied*, —— U.S. ——, 117 S.Ct. 1552 (1997) (excluding testimony regarding alternative design of tire changing machine); *Habecker v. Clark Equip. Co.*, 36 F.3d 278, 289-90 (3d Cir. 1994) (affirming exclusion of expert testimony regarding design of forklift), *cert. denied*, 514 U.S. 1003 (1995); *Watkins v. Telsmith, Inc.*, 121 F.3d 984 (5th Cir. 1997) (affirming exclusion of expert testimony regarding design of conveyor belt); *Smelser v. Norfolk Southern Railway Co.*, 105 F.3d 299, 303-05 (6th Cir.), *cert. denied*, —— U.S. ——, 118 S. Ct. 67 (1997), (reversing trial court's admission of biomechanics expert testimony). *Cf. Bogosian v. Mercedes Benz of North America, Inc.*, 104 F.2d 472, 479 (1st Cir. 1997) (affirming exclusion of mechanic's testimony on engineering issues and holding that "even if *Daubert*'s specific discussion of the admissibility of scientific principles did not strictly apply

The Texas Supreme Court has similarly held that "[n]othing in the language of the [Texas version of Rule 702] suggests that opinions based on scientific knowledge should be treated any differently than opinions based on technical or other specialized knowledge." *Gammill v. Jack Williams Chevrolet, Inc.*, 1998 WL 352951 at *13 (Tex. 1998).[8]

. . . the admissibility of the testimony was stll controlled by the requirement of factual relevance and foundational reliability.").

[8] *See also* Stephen D. Easton, *"Yer Outta Here!" A Framework for Analyzing the Potential Exclusion of Expert Testimony Under the Federal Rules of Evidence*, 32 U. RICH. L. REV. 1, 25 (1998) ("Although *Daubert* makes specific reference to science, its reasoning is not applicable only to scientific expert testimony."); Jonathan M. Hoffman, Daubert's *Application to Testimony from Non-Scientific Experts*, 26 PROD. SAFETY & LIAB. REP. 738 (1998) ("The key to applying *Daubert* in a meaningful and principled way to [non-science cases] is not to insist on lockstep proof of all four [*Daubert* factors] nor to ignore them altogether."); G. Michael Fenner, *The* Daubert *Handbook: The Case, Its Essential Dilema, and Its Progeny*, 29 CREIGHTON L. REV. 939, 948 (1996) ("[t]he general point . . . — that when expert testimony is proffered and resisted, the trial court should hold a hearing to determine whether the evidence is reliable and relevant—applies to all expert evidence"); David L. Faigman, *Mapping the Labyrinth of Scientific Evidence*, 46 HASTINGS L.J. 555, 559 (1995) (limiting *Daubert* to science "displays a crabbed interpretation of the . . . opinion as well as a misconstruction of the principles underlying Rule 702"); American College of Trial Lawyers, *Standards and Procedures for Determining the Admissibility of Expert Evidence After Daubert*, 157 F.R.D. 571, 577 (1994) ("there [should] be a single conceptual framework for evaluating the admissibility of all types of expert evidence"); Edward J. Imwinkelried, *The Next Step After* Daubert: *Developing a Similarly Epistemological Approach to Ensuring the Reliability of Non-scientific Expert Testimony*, 15 CARDOZO L. REV. 2271, 2281 (1994) ("If the mention of scientific knowledge [in Rule 702] suffices to mandate reliability standards for scientific testimony, *a fortiori* the mention of nonscientific expert knowledge should compel the courts to seek to formulate reliability standards for that type of expert evidence as well.").

B. Rule 702 Does Not Contemplate Artificial Categories of Expertise, Nor Does It Require Separate Lists of Factors for Different Kinds of Experts.

Much of the confusion about *Daubert* in the lower courts has resulted from trying to pigeonhole expert testimony into artificially distinct categories, with a different analytical approach for each category. The Second Circuit, for example, has held *Daubert* completely inapplicable to engineering expert testimony. *Iacobelli Constr., Inc. v. County of Monroe*, 32 F.3d 19, 25 (2nd Cir. 1994) (reversing trial court's exclusion of testimony regarding underground construction). The Ninth Circuit has ruled that while *Daubert*'s reliability standard is universally applicable, the factors listed by this Court apply only when science is at issue. *McKendall v. Crown Control Corp.*, 122 F.3d 803, 806-07 (9th Cir. 1997).

Rule 702, however, does not contemplate such compartmentalized analysis. The kinds of knowledge specified in the rule—"scientific, technical, or other specialized knowledge"—represent points within a continuum, not analytical categories. Nothing in the language of the rule or the Advisory Committee Notes states or even suggests that each of the adjectives modifying knowledge requires a different mode of analysis, or that courts should consider completely different sets of factors for each. In fact, as the Fifth Circuit has held, the *Daubert* factors (testability and testing, peer review and publication, error rate and standards, and general acceptance) often will have a bearing on determining the admissibility of expert evidence other than science. *Watkins v. Telsmith, Inc.*, 121 F.3d 984, 990-91 (5th Cir. 1997). *See also Cummins*, 93 F.3d at 368 n.2 (7th Cir. 1996) (*Daubert* counsels against a "wholesale abandonment of the *Daubert* analysis simply because the issue before the court . . . involves the application of science to a practical problem;" also pointing out that "the drafters of Rule

702 seem to have acknowledged that the line between 'scientific' and 'technical' is not a bright one").

The futility of trying to create bright-line distinctions between scientific and other kinds of expert testimony is starkly illustrated by another Eleventh Circuit case, *Michigan Millers Mutual Insurance Corp. v. Benfield*, 140 F.3d 915 (11th Cir. 1998). The trial court in *Michigan Millers* had applied *Daubert* in excluding the plaintiff's fire investigation testimony. *Id.* at 917. The Eleventh Circuit affirmed, primarily because the plaintiff insurance company had itself tried to characterize this area of expertise as science even though the expert had performed no tests, taken no samples, and could not explain how he had eliminated one possible source of the fire. *Id.* at 920-21. Would the court have held differently if the plaintiff had invoked different nomenclature and suggested gratuitously from the outset that the testimony was just based on observational experience? Given the same circuit's ruling in the present case, apparently so.

C. Admitting Testimony Based Only on an Expert's Claimed Experience Ignores Rule 702's Knowledge and Relevance Requirements and the Requirments of Rule 703.

The Eleventh Circuit's focus in this case on Carlson's experience observing tires effectively reduced the Rule 702 admissibility analysis to nothing more than a qualifications test.[9] The plain language of the rule, however,

---

[9] Other circuits have rejected this kind of "experience only" standard, most notably the Fifth Circuit in *Watkins v. Telsmith, Inc.*, 121 F.3d 984, 988-91 (5th Cir. 1997); and the Seventh Circuit in *Target Market Publishing, Inc. v. Advo, Inc.*, 136 F.3d 1139, 1143-45 (7th Cir. 1998). *But see Compton v. Subaru of America, Inc.*, 82 F.3d 1513, 1518-19 (10th Cir.), *cert. denied*, —— U.S. ——, 117 S. Ct. 611 (1996); *Freeman v. Case Corp.*, 118 F.3d 1011, 1016-17 (4th Cir. 1997), *cert. denied*, —— U.S. ——, 118 S. Ct. 739 (1998).

unequivocally establishes three requirements that must be met before an expert can give opinion testimony. In addition to qualifications, an expert's opinions must "assist the trier of fact to understand the evidence or to determine a fact in issue" (the "helpfulness" or "relevance test"), and the subject of the testimony must be "scientific, technical, or other specialized knowledge" (the "knowledge test").

Rule 702's inclusion of experience as one reason an expert may be qualified does not somehow eliminate the knowledge and relevance requirements for that expert's testimony.[10] Qualifications alone will not suffice, and admitting testimony based only on observational experience would effectively eviscerate *Daubert* and the rule by allowing any expert to escape scrutiny just by saying he or she had used no reasoning or methodology. The Eleventh Circuit's holding would permit a licensed physician, or even a witchdoctor, to testify about what caused a plaintiff's illness based solely on a lifetime observing sick people. *Cf. Moore v. Ashland Chemical Inc.*, 1998 WL 476214 at *5 n.6 (5th Cir. 1998) (rejecting argument that *Daubert* is limited to "hard" science, and making

---

10 Experience alone may serve as the basis for testimony about direct observations that require no interpretation or explanation. A mechanic, for example, might testify based solely on experience that all spark plugs change color with use, but such a witness would not be allowed to testify about why the plugs change color or what different colors signify. Because Carlson's testimony in this case included opinions supposedly based on what he had seen, the absence of a valid explanation of how his observations were connected to his conclusions made the testimony inadmissible. The Eleventh Circuit's citation to the beekeeper example in *Berry v. City of Detroit*, 25 F.2d 1342, 1350 (6th Cir. 1994), *cert. denied*, 513 U.S. 1111 (1995), was therefore completely irrelevant. The beekeeper would merely have reported what he had seen, albeit on numerous occasions. Carlson, however, was not reporting what failed tires looked like, but was opining about why they failed.

clear that determining medical causation is a "scientific exercise" even if the determination is made by a clinician).

The Rules do not contemplate such an illogical result. If "an expert who was well qualified as an astronomer offered to testify based on lengthy and careful observation that the sun revolves around the earth, a court would not be obliged to submit the testimony to the jury." *Target Mkt. Publ'g, Inc. v. Advo, Inc.*, 136 F.3d 1139, 1143 (7th Cir. 1998). *See also Watkins*, 121 F.3d at 991 ("it seems exactly backwards that experts who purport to rely on general engineering principles and practical experience might escape screening . . . simply by stating that their conclusions were not reached by any particular method or technique").

Because Carlson based his opinion in this case solely on his claimed past experience analyzing tire failures, and because he admitted he did not know if these prior analyses had been correct or incorrect, the Eleventh Circuit's "experience without principles" holding is also contrary to Rule 703. This rule permits an expert to base an opinion on facts or data not in evidence, but only if such information is "of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject [at issue.]" In this case the requirements of Rule 703 were not met. *See infra* Section III. Thus Carlson's testimony was properly excluded. *See Christophersen v. Allied-Signal Corp.*, 939 F.2d 1106 (5th Cir. 1991), *cert. denied*, 503 U.S. 912 (1992) (affirming exclusion of expert testimony on the cause of the plaintiff's cancer because virtually all the exposure data came from an affidavit that was "inaccurate and incomplete," and which "over-estimated the [frequency and duration of the plaintiff's exposure]."); *Renaud v. Martin Marietta Corp.*, 972 F.2d 304, 308 (10th Cir. 1992) (affirming trial court's exclusion of expert testimony regarding migration of contamination based on a single data point). *Cf. Allen v. Pennsylvania Eng'g*

Corp., 102 F.3d 194, 198-99 (5th Cir. 1996) (affirming exclusion of expert testimony in toxic tort case because of insufficient exposure data).

II. BECAUSE ENGINEERS AND SCIENTISTS USE THE SAME BASIC METHODOLOGY AND REASONING PROCESS TO EVALUATE THE VALIDITY AND RELIABILITY OF THEIR WORK, IT IS PROPER TO USE *DAUBERT*'S GUIDANCE ON SCIENTIFIC EVIDENCE IN ASSESSING THE ADMISSIBILITY OF ENGINEERING FAILURE ANALYSIS EXPERT TESTIMONY.

Though Carlson has two degrees in mechanical engineering, the Eleventh Circuit did not make clear if it considered his failure analysis in this case to be engineering or something else.[11] The court, however, *did* hold that his testimony was non-scientific, *Carmichael*, 131 F.3d at 1436, which raises two fundamental questions: (1) is engineering completely distinct from science; and (2) is failure analysis separate from engineering? Because the answer to both of these questions is "no," the court erred in ruling that *Daubert*'s guidance on science was inapplicable. The three "fields"—science, engineering, and failure analysis—present a prime example of how artificial categories of expert evidence can thwart the application of Rule 702. They are so closely intertwined that bright-line distinctions between them serve no useful purpose and are only misleading.

A. The Reasoning and Methodology of Engineering Do Not Differ From the Reasoning and Methodology of Science.

Dictionaries and encyclopedias typically define engineering as "applied science." *See, e.g.*, THE AMERICAN

[11] Carlson himself testified at his deposition that he considered himself a specialist in "tire failure analysis and other questions having to do with design or failure analysis *as a result of being a mechanical engineer*." Carlson Deposition in *Carmichael v. Samyang Tires, Inc.*, March 7, 1995 at 117-118 (emphasis added).

HERITAGE COLLEGE DICTIONARY 456 (3d ed. 1997) (engineering is the "application of science to practical ends"); 6 THE WORLD BOOK ENCYCLOPEDIA 284 (1991) (engineering is "the profession that puts scientific knowledge to practical use"). This kind of shorthand definition correctly indicates that engineering and science are closely linked, but does not fully capture the extent to which scientific reasoning and methodology permeate engineering practice. Engineers do not just apply scientific discoveries; they use the scientific method.

Both science and engineering involve an interaction between imaginative creativity and analytical rigor. The scientist seeks to expand our understanding of the natural world by formulating hypotheses and subjecting them to critical examination and empirical testing. Bert Black, et al., *Science and the Law in the Wake of* Daubert: *A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715, 756-57 (1994). Engineering knowledge similarly "grows . . . through a complex interplay of experiment and theory." Walter G. Vincenti, WHAT ENGINEERS KNOW AND HOW THEY KNOW IT: ANALYTICAL STUDIES FROM AERONAUTICAL HISTORY 12 (1990). Engineers, however, seek not just to understand and explain, but to modify, control, and shape the world in which we live. After formulating a conceptual design or solution to a problem—a step equivalent to the scientist's hypothesis—an engineer undertakes an analysis as a "scientist in as rigorous an application of the scientific method as any scientist must make." Henry Petroski, TO ENGINEER IS HUMAN: THE ROLE OF FAILURE IN SUCCESSFUL DESIGN 40 (Vintage Books ed. 1992).

Reflecting the broad overlap in their disciplines, scientists often work to apply their discoveries, and engineers often do basic research required to solve engineering problems. Hence the appearance of combined fields such as "applied physics" and "engineering science." Any attempted distinction between the reasoning process of a research engineer and an applied scientist would be mean-

ingless, and trying to distinguish the reasoning of an engineer doing engineering from that of a scientist doing science makes equally little sense.[12]

B. Failure Analysis Is an Integral Part of Engineering, and It Is Based on Scientific Reasoning and Methodology.

Because engineers strive for efficient and cost effective designs that make the best use of available materials, they have to be acutely aware of failure and its causes. Shinichi Nishida, FAILURE ANALYSES IN ENGINEERING APPLICATIONS 6-7 (1992). "[A]n understanding of failure in all its real and imagined manifestations [lies at the heart of the engineering method]." Henry Petroski, DESIGN PARADIGMS. CASE HISTORIES OF ERROR AND JUDGMENT IN ENGINEERING 184 (4th ed. 1994). In recognition of this crucial concern, Canadian engineers wear iron rings, which according to traditional lore serve as reminders of the deadly 1907 collapse of a bridge over the Saint Lawrence River near Quebec City. Henry Petroski, *The Iron Ring*, 83 AMERICAN SCIENTIST 229, 231 (1995) (though the iron ring originated for another purpose, the "persistent story of [its] coming from [the wreckage of

---

12 Indeed, several courts have recognized the extremely close relationship between science and engineering. *See, e.g., Berry v. City of Detroit*, 25 F.3d 1342, 1349-50, *cert. denied*, 513 U.S. 1111 (1995) (using aeronautical engineering as an example of science); *Cummins v. Lyle Indus.*, 93 F.3d 362, 368-71 (7th Cir. 1996) (stating that: "We believe [*Daubert*] counsels against a wholesale abandonment of the *Daubert* analysis simply because the issue before the court, although rooted in science, involves the application of science to a concrete and practical problem."); *Gammill v. Jack Williams Chevrolet, Inc.*, 1998 WL 352951 at *8 (Tex. 1998) (stating that "mechanical engineering is science"); *Jaurequi v. John Deere Co.*, 971 F. Supp. 416, 424 (E.D. Mo. 1997) (*Daubert*'s guidance is applicable to cases involving expert testimony from engineers); *Cf. Watkins v. Telsmith*, 121 F.3d 984, 990-91 (5th Cir. 1997) (holding *Daubert*'s guidance applicable even if engineering is not identical to science).

the bridge] . . . serves as a constant reminder of the fallibility of an engineer and the consequences of error."). The collapse occurred because the bridge's engineers, in designing what is still the world's longest cantilever bridge, made critical miscalculations. *Id.* at 230-231.

Today, failure analysis is well recognized within the engineering profession. The American Society of Civil Engineers has even published guidelines for engineers who specialize in this area of engineering practice, which is defined as "the application of the *engineering sciences* to the investigation of failures or other performance problems." Task Committee on Guidelines for Failure Investigation, GUIDELINES FOR FAILURE INVESTIGATION 5 (1989) (emphasis added). These guidelines also make clear that a failure investigation should proceed by generating "hypotheses [that] will be proven or disproven, resulting in a failure hypothesis that can be supported by the . . . investigator." *Id.* at 157.

The reasoning process of failure analysis is therefore the same as the reasoning process of science and the reasoning process of engineering design. It involves not only investigation, but analysis, which "explores the *why* and *how*, identifies causation elements and their interrelationships, determines causation sequence, and tries to develop a clear and unambiguous understanding of what led up to the failure event." Charles E. Witherell, MECHANICAL FAILURE AVOIDANCE: STRATEGIES AND TECHNIQUES 38 (1994). A failure analysis should always "[a]void speculation, rationalization, intuition, and inferences based upon lack of information," *id.* at 55, and conclusions should never extend further than the findings of an investigation warrant. *Id.* at 59.

The specific steps for any given failure analysis depend on the kind of product at issue, the circumstances of its failure, and the kinds of data available. As a general rule, however, a failure analyst should consider the mate-

rial that failed (including its appearance and available test data about it), the design stress and service conditions, and in some cases simulation tests. It is an overall examination of this information that leads to a conclusion about the cause of a failure. Nishida, *supra* at 6-7 (1992). Because failures typically involve changes in the size, shape, or material properties of a product, test results and the appearance of a failed product sometimes may be diagnostic of the mode and cause of failure. Jack A. Collins, FAILURE OF MATERIALS IN MECHANICAL DESIGN: ANALYSIS, PREDICTION, PREVENTION 6 (1981). For example, "[s]urface fatigue failure, usually associated with rolling surfaces in contact, manifests itself as pitting, cracking, and spalling of the contacting surfaces." *Id.* at 9.

If an analysis is based only on correlating observations and test results with known manifestations of failure, however, its validity and reliability still depend on scientific reasoning. Both the known manifestations of the failure mode and the observational and test data must be precisely defined and described.[13] Moreover, there should be a clear explanation of why the correlation supports a conclusion about causation. Merely saying "that a part broke because of metal fatigue . . . is not enough . . . [One must further ask]: Why did metal fatigue occur?" Harold Carlson, SPRINGS: TROUBLESHOOTING AND FAILURE ANALYSIS 128 (1980). An analyst develops a coherent answer to this kind of question by formulating hypotheses and then checking them against test results

[13] As an example, failure analysts who specialize in glass and ceramic products have developed the science of examining fracture patterns "to the point where there is a considerable body of literature on the subject." James R. Varner, *Descriptive Fractography*, *in* 4 ENGINEERED MATERIALS HANDBOOK 635, 635 (1991). By comparing a specific fracture marking with known kinds of patterns, these specialists can locate fracture origins, determine the direction of crack propagation, learn the sequence of crack propagation, deduce the stress state at the time of fracture, and observe other aspects of a failure. *Id.* at 635-644.

and observations, a process that tracks the scientific method exactly. Task Committee on Guidelines for Failure Investigation, *supra* at 62 ("as data is collected and analyzed, the initial hypothesis may be proven, abandoned, or revised, based on the synthesis of investigative data").

C. The Considerations Outlined in *Daubert* for Assessing the Admissibility of Scientific Evidence Are Applicable to Engineering Failure Analysis Testimony.

As discussed *supra* in Section II.A., science and engineering, though not identical, both use the same kind of reasoning process. In addition, as discussed *supra* in Section II.B., failure analysis is very much a part of engineering. *Daubert*'s guidance on how to assess the validity of scientific testimony is therefore generally applicable to failure analysis evidence as well. How to apply this guidance in any given case depends on the specific facts at issue, which is why *Daubert* admonished that its discussion of various factors should be treated only as general observations. *Daubert*, 509 U.S. at 593.

The primary concern in all cases must be a rational and principled explanation connecting an expert's conclusions with the data and information upon which he or she relied. Though not explicitly addressed in *Daubert*, the need for clear explanatory reasoning was a central part of the holding in *Joiner*, which emphasized that experts must explain how and why they reach their conclusions. *Joiner*, 118 S. Ct. at 518-519. This requirement is not just a legal rule. It is the common thread that ties science, engineering, and failure analysis together.

III. TIRES ARE COMPLEX AND SOPHISTICATED PRODUCTS, AND A VALID AND RELIABLE TIRE FAILURE ANALYSIS REQUIRES FAR MORE THAN AN "EXPERIENCE WITHOUT PRINCIPLES"/LOOK AND GUESS APPROACH.

The expert testimony at issue in this case illustrates all too well why *Daubert* gatekeeping should apply to all experts, and why the *Daubert* analysis should not arbitrarily and artificially be limited to science. Most people take tires for granted and give them little thought, but these seemingly simple products are actually sophisticated structures composed of many separate parts. Modern tires are the culmination of years of scientific and engineering work, and they may be the most complex components of an automobile. R. A. Ridha & M. Theves, *Advances in Tire Mechanics, in* RAPRA REVIEW REPORTS 3 (Report 77, 1994).

A tire is expected to carry heavy loads, to minimize rolling resistance, to provide the traction that translates the engine's power into motion, and to last for many thousands of miles in service. F. J. Kovac & M. B. Rodgers, *Tire Engineering, in* SCIENCE AND TECHNOLOGY OF RUBBER 675, 676 (James E. Mark et al. eds., 1994). Tire design also has to consider steering, braking, cornering, shock cushioning and handling, *id.*; Ridha & Theves, *supra*, at 3. Furthermore, all these functions must be performed at the extremes of heat and cold, and on roads that are sometimes dry, sometimes wet, and sometimes covered with snow or ice.

Today's tires are a far cry from the first pneumatic tire, which was made in 1845 by wrapping a rubber tube with leather. Jan P. Norbye, THE MICHELIN MAGIC 48-49 (1982). In the ensuing 153 years, the tire has truly become an "engineering marvel" and a "masterpiece of technology." Kovac & Rodgers, *supra*, at 677. The design and manufacture of these complex products requires the application of scientific principles and knowledge, and

careful engineering analysis. Failures in service are rare, and generally result from abuse, but if it is possible, manufacturers analyze them with a principled, reasoned approach to determine causes. Stephen Bobo, *Tire Flaws and Separations, in* MECHANICS OF PNEUMATIC TIRES 636 (Samuel K. Clark ed., 2d ed. 1981).

A. Modern Tires Are Complex and Sophisticated Products.

A modern steel belted passenger car tire is a carefully designed and engineered combination of rubber, fabric, steel and other materials that must meet competing demands. Layers, or plies, of rubber coated fabric form the body of the tire, which must be strong enough to contain the air pressure, yet flexible enough to absorb shocks. The tread, or wearing surface of a tire must be durable and tough, but not too hard and brittle. It provides traction, wet skid resistance and cornering characteristics, but must not create too much noise and vibration. Ridha & Theves, *supra*, at 3; Kovac & Rodgers, *supra*, at 677-79.

Between the tread and the body are the steel belts, which improve wear and handling response, and protect the plies from road hazards. The steel cannot be too inflexible, but still must help maintain optimum stiffness. Both the plies and the belts are encased in various types of rubber, each with different qualities for the different functions it must perform.[14] The technology of compounding rubber and combining it with other components to make a finished tire depends on an understanding of polymer chemistry, mechanical engineering, metallurgy, and other disciplines. Kovac & Rodgers, *supra*, at 678; S. D. Gehman, *Rubber Structure and Properties, in* ME-

[14] Tread rubber must be harder and stiffer than sidewall rubber, which must flex as the tire moves down the road. The innerliner of the tire acts as a seal and consequently must be still a different type of rubber compound. The rubber used between the steel belts and body plies is also a different composition.

CHANICS OF PNEUMATIC TIRES 1-33 (Samuel K. Clark ed., 2d ed. 1981).

Though each tire component must perform its own specific function, every component affects all the others. Once assembled, the parts of a tire are vulcanized to bond them together and mold them into a composite structure. Vulcanizing involves a chemical reaction brought about by the application of pressure and heat over time. V.E. Gough, *Structure of the Peumatic Tire*; *in* MECHANICS OF PNEUMATIC TIRES 225-29 (Samuel K. Clark ed., 2d ed. 1981); Gehman, *supra*, at 15; R. C. G. Arridge, AN INTRODUCTION TO POLYMER MECHANICS 66 (1985). In a completed tire the various components must be mechanically compatible to provide the optimum balance of numerous desired performance characteristics, such as ride, handling, and wear. Tire manufacturers consider all these factors in developing and producing their products. Kovac & Rodgers, *supra*, at 708-12; Ridha & Theves, *supra*, at 8; H. van Eldik Thieme & A. J. Dijks, *Measurement of Tire Properties, in* MECHANICS OF PNEUMATIC TIRES 541-635 (Samuel K. Clark ed., 2d ed. 1981).

In addition, consistent with federal performance requirements,[15] indoor test wheels have been devised to run

[15] The United States government requries that tires meet certain performance criteria. The reference to a Department of Transportation symbol on the sidewall of a tire indicates the manufacturer's certification that, if tested, it would meet or exceed the tests specified under either 49 C.F.R. § 571.109 (for passenger tires) or § 571.119 (for truck, light truck, and motorcycle tires). These tests determine whether the structure of the tire can achieve intended performance and withstand the conditions expected during road use. Designers or manufacturers typically will test even more stringently and study various forms of failure mechanisms during these tests. Testing devices enumerated in the federal government standards provide a means for measuring load, inflation, and the effect of time under extremely severe conditions in order that manufacturers can determine the ultimate limits of physical and structural properties.

tires for extended periods of time at speed and under load. The wheels are comprised of a rotating 67 inch drum against which the tire is pressed at a selected load. 49 C.F.R. § 571.109, subsection S5.4.2.1; Bobo, *supra*, at 636. Because an indoor test wheel can be controlled quite precisely, test conditions can be repeated, which makes it possible to conduct comparison tests to determine how varying selected parameters affect performance and durability. Testing also may take place on a test track, or by monitoring selected tires in service. Over time, this kind of testing has resulted in a body of known empirical information about how some modes of failure correlate with specific causes.

B. The Appropriate Approach to Tire Failure Analysis.

Tires fail only rarely in service, and failures due to defects in design or manufacture are exceedingly rare. Even Carlson acknowledged that such defects cause only a small percentage of tire failures that occur before the end of tread life. Carlson Deposition in *Carmichael v. Samyang Tires, Inc.*, May 15, 1995, at 394. When failures do occur, they can provide valuable information, but only if they are analyzed properly, in accordance with the general principles of failure analysis described *supra* in Section II.B.

Several recent legal decisions highlight how the general failure analysis principles apply in the context of a tire failure case. These decisions emphasize the use of scientific knowledge and scientific reasoning and methodology, and they all apply the kind of analysis outlined in *Daubert*. *See Diviero v. Uniroyal Goodrich Tire Co.*, 919 F. Supp. 1353 (D. Ariz. 1996), *aff'd*, 114 F.3d 851 (9th Cir. 1997); *Mitchell v. Uniroyal Goodrich Tire Co., Inc.*, 666 So.2d 727 (La. Ct. App. 1995); *Clement v. Griffin*, 634 So.2d 412 (La. Ct. App. 1994).

Fundamental to tire failure analysis is an understanding of the principles of engineering, chemistry, and re-

lated fields that impact tire design and manufacturing. Knowledge of how the components of a tire are put together and how they come apart also is required. *See, generally*, Samuel K. Clark, editor, MECHANICS OF PNEUMATIC TIRES (2d ed. 1981). *See also Diviero*, 919 F. Supp. at 1356. The analyst further must understand how certain failure modes occur under controlled conditions. *Id.* From years of correlating failure modes with causes, a consensus has developed about how to interpret the appearance of a failed tire.[16] Tire failure analysts synthesize such knowledge with the facts of a specific case to reach a valid and reliable conclusion.

The study of rubber fracture mechanics, especially where tire components interface, provides insight into the history of a failed tire's use and the conditions of its failure. Ultimately, analysts seek to explain the cause of failures by determining the mechanics of fracture in light

---

[16] Based on years of experience testing, observing, and applying scientific principles to the analysis of tire failures, certain information and basic understandings about tires have become almost axiomatic. Various forms of use and abuse lead to certain identifiable and repeatable conditions of failure. For example, when tires are run underinflated heat can build up, which ultimately can lead to failure with certain established indicia. C.L. Schnuth, et al., *Compression Grooving and Rim Flange Abrasion as Indicators of Overdeflected Operating Conditions in Tires* (Based on paper presented to Rubber Division of American Chemical Society, October 21-24, 1997); J.D. Walter & R.K. Kiminecz, *Bead Contact Pressure Measurements at the Tire Rim Interface* (Presented to the Society of Automotive Engineers, February 24-28, 1978). Punctures in tires ultimately cause air loss and result in failure leading to recognizable conditions. Impact damage to tires can also cause failure. Various forms of abnormal tire wear are indicative of improper inflation, balance, and alignment. These recognized conditions form a base of scientific knowledge from which tire manufacturers and failure analysts work because they are repeatable, tested, and known. Rubber Manufacturers Association, CARE AND SERVICE OF AUTOMOBLE AND LIGHT TRUCK TIRES 23-24 (1995); Tire Maintenance Council, RECOMMENDED MAINTENANCE PRACTICES MANUAL AV2-8 (1992-1993).

of conditions known through testing and evaluation to be indicia of failure modes. Ronald W. Smith, *The Microscopy of Catastrophic Tire Failures, in* 70 RUBBER CHEMISTRY AND TECHNOLOGY 283 (1997); G. R. Hamen, et al., *Tensile and Tear of Anisotropic Double Networks of a Black Filled Natural Rubber Vulcanizate, in* MECHANISM OF FATIGUE AND ABRASION OF RUBBER VULCANIZATES (Edison Polymer Innovation Corporation 1997); A. B. Mitchell, et al., *The Application of Fractography and Other Examination Methods to the Failure Analysis of Polymeric Components, in* FAILURE ANALYSIS: TECHNIQUES AND APPLICATIONS 269-78 (J. I. Dickson et al. eds., 1992).

The actual analysis of a given tire failure requires the development of hypotheses based on conditions known to be correlated with failure and the fundamental principles of science and engineering. *Diviero*, 919 F. Supp. at 1356 & 1359; *Mitchell*, 666 So.2d at 730; *Clement*, 634 So.2d at 427. Knowledge of the field conditions under which the tire operated also is important. Factors such as the maintenance of the vehicle and tires, conditions of use, and the events leading up to the failure are likewise part of the groundwork essential to a reasoned and rational analysis. Lawrence H. Curtis & James D. Gardner, *Methodology of Science and Law in Product Liability* (Proceedings PLP-77E, New Jersey Institute of Technology, 1977).

The process of physical investigation usually starts with a visual and tactile examination that notes all important observable conditions and records them to assure that any analysis can be replicated if necessary. Bobo, *supra*, at 636; Curtis & Gardner, *supra*, at 20-23. *See also Diviero*, 919 F. Supp. at 1360. Because a failed tire often is not complete, comprehensive knowledge of what the missing or mutilated parts would have looked like, and how they would have functioned, can be very important to an analysis. Curtis & Gardner, *supra*, at 22. *See also Mitchell*, 666 So.2d at 729-30.

Examinations should be conducted in properly equipped facilities with appropriate lighting and the necessary tools. In noting observable conditions, the examiner should take adequate time to avoid missing essential features and evident patterns of fracture. The use of microscopes and recordation through photographs assists in detecting such patterns. Clear recording of all data from all observations is essential. Curtis & Gardner, *supra*, at 21 & 23.

When circumstances warrant, analysts also may use auxiliary testing. For example, if there is reason to suspect that a foreign substance on a tire caused a failure, chemical tests can determine if such a substance is present as well as its composition. Analytical techniques such as infrared, near infrared, and ultraviolet spectroscopy can assist in this kind of investigation. In other cases, the testing of exemplar tires may be appropriate. The hypothesis that wear patterns on a tire resulted from certain conditions can be corroborated by testing the same type of tire under those conditions to see if the same patterns occur. If they do, the hypothesis is corroborated; if not, it is disproven. Subjecting exemplar tires to tearing and destruction likewise may reveal fracture patterns similar to those in a failed tire. The use of visual aids such as x-rays and magnification devices sometimes can assist in comparing a failure pattern with patterns known to be related to specific causes. Other tests with exemplar tires run on test wheels or vehicles also may help confirm or disprove suspected failure modes. Curtis & Gardner, *supra*, at 24-25; Bobo, *supra*, at 636.

In moving from hypothesis to conclusion, an analyst integrates basic principles, established correlations, the conditions surrounding the failure, observations of the tire, and test data. The result is a well-reasoned and replicable conclusion based on positive proof. *Diviero*, 919 F. Supp. at 1360. This kind of scientific reasoning process does not differ from the reasoning process used in

engineering or in the analysis of other kinds of failures, and like engineering or failure analysis in general, it is the kind of methodology that is particularly suited to scrutiny under *Daubert*.

C. The Expert Testimony in This Case Was Based Upon Speculation, Was Logically Invalid and Failed to Follow Appropriate and Accepted Methods—All From an Expert Who Admitted He Did Not Know If the Basis for His Opinions Was Correct or Incorrect.

In this case Carlson relied solely upon the claim that his experience supported his conclusions. At his deposition he testified that as part of this experience, he had examined many failed tires. At the same time he admitted he did not know if his conclusions about those other tires had been correct or incorrect. *Carmichael*, 923 F. Supp. at 1521. Indeed, if Carlson reached his conclusion about those tires using the same approach he used in this case, all of his experience must come into question. His testimony here cannot be reliable because he relied on nothing but his look and guess approach, even though he could have—and should have—used the principled and rational methodology generally used by the tire industry.

Had the District Court excluded Carlson's testimony based just on its fundamentally flawed logic there would have been no abuse of discretion. *See Diviero*, 114 F.3d at 853 (affirming exclusion of unsubstantiated and subjective testimony), *Gammill*, 1998 WL 352951 at *15 (affirming exclusion of testimony where expert had gap in analysis). The Court's application of *Daubert* only reinforces its decision. The *Daubert* analysis was appropriate because it helped the court in penetrating Carlson's fatally flawed logical construct.

Carlson's methodology and reasoning closely paralleled the reasoning and methodology of the expert excluded in *Diviero*. First, there was a self-serving, unsupported, and

untrue claim that there was no recognized industry methodology for analyzing tire failures.

Second, Carlson's testimony involved an *ad hoc* set of hypotheses that had not—and could not—be tested or evaluated.[17]

Third, Carlson failed to provide any positive proof of a defect; instead picking and choosing evidence beneficial to a preconceived conclusion, and ignoring contrary evidence without accounting for it.[18]

---

[17] The term *"ad hoc"* characterizes a hypothesis that accounts only for the particular fact or facts it was invented to explain, and which has no other explanatory power. As a result, such a hypothesis has no testable consequences. An *ad hoc* hypothesis represents an attempt to confuse scientific explanation with mere description or generalization of the facts observed. Irving M. Copi & Carl Cohen, INTRODUCTION TO LOGIC 446-447 (8th ed. 1990); James K. Feibleman, SCIENTIFIC METHOD (THE HYPOTHETICO-EXPERIMENTAL LABORATORY PROCEDURE OF THE PHYSICAL SCIENCES) 101 (1972). Rather than setting up hypotheses about testable causes of failure, Carlson developed two "hypotheses" (more aptly, premises) that had not and could not be tested, evaluated, or replicated. He provided no objective support to show that his "hypotheses" were anything more than nonprovable classifications. The first "hypothesis" declared that if he found evidence of two of four indicators of overdeflection on a tire, he would conclude that the tire had failed from abuse. The second "hypothesis" declared that if he found less than two indictors of overdeflection, he would conclude that the tire had failed from a manufacturing defect. Carlson did not provide any support for the proposition that there are only four signs of overdeflection on an abused tire, nor did he explain how he arrived at rule that two signs indicate abuse, but less than two indicate defect. His seat-of-the-pants "numerology" was unsupportable, not testable, and as a result not verifiable. It is no wonder he was unable to provide any objective support for his conclusion in the face of observed conditions that have been demonstrated through testing to result directly from abuse.

[18] Carlson formed a preconceived conclusion before he even looked at the tire. He issued a report concluding that the tire failed from a defect in manufacture before conducting any visual or other inspection of it. He had to concede that there was extensive evidence indicative of abuse through overdeflection, but chose to ignore that

Fourth, there was no support in any testing, articles, statistics or established knowledge about tires for the connection Carlson postulated between his observations and his conclusions.

Fifth, Carlson categorized various indicia as being the universe of conditions that could establish whether abuse or defect had caused a tire failure. The number and relative importance of the indicia were not supported by any objective criteria. Carlson essentially provided his subjective speculation in the guise of objective fact. *See Diviero,* 114 F.3d at 852.

Sixth, Carlson's apparent attempt to use a process of elimination failed because he did not account for all possibilities and he tested none. More importantly, he observed several signs that clearly pointed toward abuse as the cause of failure, but he discarded this information without any rational explanation.

Carlson's attempt to justify his look and guess reasoning with his "numerology" technique for distinguishing abuse failures from defect failures ostensibly had some basis in his prior experience,[19] but information about this experience was never produced, and there was no way to determine if he had been right or wrong in the past. Thus there was an unbridgeable statistical and empirical gap

---

evidence because it was contray to his preconceptions. Again, no articles, tests, or other objective criteria, such as comparison with known conditions of failure were used to justify his discounting of the evidence of overdeflection, and Carlson performed no tests of his own. As noted *supra*, various failures in tires can be induced through laboratory or track testing in an effort to replicate the condition of failure and thereby draw conclusion about various indicia found on a tire. Carlson used none of these methods. Instead he refused to be dislodged from his preconceived conclusion. He looked at the tire, ignored contrary evidence, and simply repeated his conclusion. Given the inadequate basis for his opinion, it could have been excluded under Rule 703 as well as Rule 702.

[19] See *supra* footnote 17.

in his reasoning. His approach is a classic example of the dangers of *ad hoc* explanations, dangers that are best exposed for both engineering and scientific testimony by a careful review of the reasoning and methodology ostensibly used to link observations to conclusions. *Joiner*, 118 S. Ct. at 518 (reinstating trial court's exclusion of testimony that failed to explain link between animal studies and causation of disease in humans). The District Court properly applied *Daubert* to conduct just this kind of review, and its ruling on summary judgment should not have been reversed.

CONCLUSION

For the foregoing reasons, the RMA urges this Court to reject the Eleventh Circuit's misinterpretation of *Daubert* and Fed. R. Evid. 702. RMA prays this Court to reverse the ruling below and to reinstate the District Court's judgment in favor of the Petitioners.

Respectfully submitted,

MICHAEL L. MCALLISTER
MICHAEL L. MCALLISTER, LTD.
2025 North Third Street
Suite 100
Phoenix, Arizona 85004
(602) 253-8840

BERT BLACK
Counsel of Record
JOHN SEPEHRI
HUGHES & LUCE, L.L.P.
1717 Main Street
Suite 2800
Dallas, Texas 75201
(214) 939-5500

MICHAEL S. TRUESDALE
HUGHES & LUCE, L.L.P.
111 Congress Avenue
Suite 900
Austin, Texas 78701
(512) 482-6800
Counsel for Amicus Curiae

August 24, 1998